CLAIMS

1. A method for preparing a non-thermal plasma reactor having individually retained plates comprising:

stacking an alternating sequence of reactor plates;

spacing said plates by disposing a temporary spacer between adjacent plates to define exhaust gas passages between adjacent plates;

disposing an insulating layer on each of a pair of opposing sides of said stack;

compressing said stack thereby forming folds in said insulating layer, said folds extending into said exhaust gas passages;

wrapping said reactor stack with an insulating retention material; and

applying suitable electrical connections to said plates.

2. The method of claim 1, wherein said insulating layer is insulated from the group comprising an insulating ceramic fiber material and a green layer of tape cast ceramic material.

3. The method of claim 1, further comprising:

removing said temporary spacer after inserting said stack into a housing.

4. The method of claim 1, wherein said temporary spacers comprise a one piece tool connected to a device adapted to pull said tool from between said plates.

5. The method of claim 1, wherein said spacing is a two stage spacing comprising:

a first stage comprising spacing said plates at a first distance suitable for preparing said reactor stack; and

a second stage comprising spacing said plates at a second distance suitable for canning said stack into a housing.

6. The method of claim 5, wherein spacing is with a temporary spacer comprising a collapsible temporary spacer.

7. The method of claim 5, wherein spacing is with a pair of differentially sized temporary spacers.

8. A method for preparing a non-thermal plasma reactor having individually retained pairs of positive and negative plates comprising:

stacking an alternating sequence of pairs of positive and negative reactor plates;

temporarily spacing said pairs of plates by disposing a temporary spacer between opposing pairs of said plates;

disposing permanent pleated insulating separators on each side of said stack;

whereby pleats of said permanent pleated insulating separator extend between opposing pairs of said plates; said temporary spacer defining a gap between said opposing pairs of plates sufficient to enable insertion of said permanent pleated insulating separator therebetween;

compressing said stack whereby said pleats extending into said exhaust channels are compacted to define said exhaust passage height;

wrapping said reactor stack with an insulating retention material;

applying suitable electrical connections to said plates;

inserting said wrapped stack into a reactor housing; and

removing said temporary spacers to prepare said non-thermal plasma reactor;

applying suitable inlet and outlet connections to said reactor housing;

wherein said reactor plates are secured by said insulating retention material in combination with said permanent pleated insulating separators enabling individual pairs of said plates to expand or contract independently of one another during operation.

9. The method of claim8 , wherein said ceramic retention material extends along sides of said reactor stack, partially covering reactor top and bottom surfaces, said ceramic retention material resiliently compressing said plates against said permanent pleated insulating separators.

10. The method of claim 8, wherein said permanent pleated insulating separators comprises a pair of separators each having a plurality of pleats, one member of each pair being disposed on each side of said reactor.

11. The method of claim 8, wherein said permanent pleated insulating separators comprise a plurality of discrete pleated separators disposed between said plate pairs.

12. The method of claim 8, wherein said retention material extends over sides of said reactor, partially covering top and bottom surfaces of said reactor, said retention material resiliently compressing said plate pairs against said permanent pleated insulating spacers.

13. The method of claim 8, further comprising:

disposing a rigid ceramic insulating filler at top and bottom ends of said stack to prevent exhaust gases from bypassing said reactor.

14. A non-thermal plasma reactor having individually retained plates comprising:

a housing containing an alternating sequence of pairs of positive and negative reactor plates;

exhaust gas passages defined between said pairs of positive and negative plates;

an insulating layer disposed on each side of said stack, folds of said insulating layer extending into said exhaust channels;

an insulating retention material wrapped around said stack;

suitable electrical connections provided to said plates;

suitable inlet and outlet connections provided to said housing;

wherein said reactor plates are secured by said insulating layer enabling individual pairs of said plates to expand or contract independently of one another during operation.

15. The reactor of claim 14, wherein said insulating layer comprises an insulating ceramic fiber material or a green layer of tape cast ceramic material.

16. A non-thermal plasma reactor having individually retained plates comprising:

a housing containing an alternating sequence of pairs of positive and negative reactor plates defining exhaust gas passages between said pairs of positive and negative plates;

permanent pleated insulating separators disposed on each side of said stack; whereby pleats of said permanent pleated insulating separator extend between opposing pairs of said plates defining said exhaust passage height;

an insulating retention material wrapped around said stack;

suitable electrical connections provided to said plates;

suitable inlet and outlet connections provided to said housing;

wherein said reactor plates are secured by said insulating retention material in combination with said permanent pleated insulating separators enabling individual pairs of said plates to expand or contract independently of one another during operation.

17. The reactor of claim 16, wherein said ceramic retention material extends over sides of said reactor to partially cover reactor top and bottom surfaces, said ceramic retention material resiliently compressing said plates against said permanent pleated insulating separators.

18. The reactor of claim 16, wherein said permanent pleated insulating separators comprises a pair of separators each having a plurality of pleats, one member of each pair being disposed on each side of said reactor.

19. The reactor of claim 16, wherein said permanent pleated insulating separators comprise a plurality of discrete pleated separators disposed between said plate pairs.

20. The reactor of claim 16, wherein said retention material extends over sides of said reactor, partially covering top and bottom surfaces

of said reactor, said retention material resiliently compressing said plate pairs against said permanent pleated insulating spacers.

21. The reactor of claim 16, wherein said permanent pleated insulating separator comprises mica, Cogebi 132P mica, tape-cast ceramic material in the "green" state, or molded rigidized ceramic fiber.

22. The reactor of claim 16, further comprising:

a rigid ceramic insulating filler disposed at top and bottom ends of said stack plates.

23. A method for preparing a non-thermal plasma reactor having individually retained pairs of positive and negative plates comprising:

stacking an alternating sequence of pairs of positive and negative reactor plates;

spacing said pairs of plates by disposing a temporary spacer between opposing pairs of said plates to define exhaust gas passages between said pairs of positive and negative plates;

applying suitable electrical connections to said plates;

wrapping a retention material around said stacked plates;

lightly compressing said stack thereby extending said retention material slightly into said exhaust channels at sides of said stack;

inserting said wrapped stack into a reactor housing; and

removing said temporary spacers to prepare said non-thermal plasma reactor;

applying suitable inlet and outlet connections to said reactor housing;

wherein said reactor plates are secured by said retention material, enabling individual pairs of said plates to expand or contract independently of one another during operation.

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24. The method of claim, further comprising:

disposing a rigid plate at top and bottom ends of said stacked plates.

25. A non-thermal plasma reactor having individually retained plates comprising:

a housing containing an alternating sequence of pairs of positive and negative reactor plates;

exhaust gas passages defined between said pairs of positive and negative plates;

an insulating retention material wrapped around said stack;

suitable electrical connections provided to said plates;

suitable inlet and outlet connections provided to said housing;

wherein said reactor plates are secured by said insulating retention material enabling individual pairs of said plates to expand or contract independently of one another during operation.

26. The reactor of claim 25, further comprising:

a rigid plate disposed at top and bottom ends of said stacked plates.

27. The reactor of claim 26, wherein said rigid plate is a mica plate.